

CONTRIBUTIONS TO A MORE EXACT KNOWLEDGE
OF THE GEOGRAPHICAL DISTRIBUTION OF
AUSTRALIAN BATRACHIA. No. IV.

BY J. J. FLETCHER.

To the kindness of Messrs. A. Sidney Olliff, C. T. Musson, J. H. Rose, W. W. Froggatt, R. Helms, and in particular Mr. A. M. Lea, I am indebted for the additional material upon which the following notes are based. Mr. Lea's specimens, referable to nineteen species, or more than half the total number of species found in New South Wales, were obtained on the Lower Clarence and the Northern Tableland. Those from the former locality are of interest as being supplementary to an important collection which I have already recorded from the Richmond River. Those from the Tableland are not less important because collections from this part of the colony have hitherto not been obtainable; and, as previously pointed out, the peculiar distribution of a few species seems in some measure to be due to the proximity of the sources of the eastern and western waters in this region, the coastal portion of which is so favourable to animal life.

(i.) *The coastal division of N.S.W.*

(u) From the Maclean on the Lower Clarence (Mr. A. Sidney Olliff).

Hyla cærulea, *H. chloris*, and *Hylella bicolor*.

(v) From the Lower Clarence [Ulmarra to Chatsworth] (Mr. A. Lea).

Limnodynastes peronii
ornatus

Hyla cærulea
peronii

*Cryptotis brevis**Pseudophryne coriacea**Hyla chloris*, Blgr.*Hyla dentata**aurea**nasuta**Hylella bicolor*.

Of the thirteen species represented in Mr. Helms' collections from the Richmond River, six are to be found in Mr. Lea's collections. The Northern River Districts may thus be credited with twenty species, of which I have noted eighteen, two (*Chiroleptes* sp.* and *Hyperolia marmorata*) having not yet come under my notice. Ten of them are recorded in the B. M. Catalogue (2nd ed.) from the Clarence, and twelve (including *H. verreauxi* and *Litoria marmorata*, A.D., a species omitted from his latest list) by Mr. Krefft, also from the Clarence.

Phanerotis is at present known only from one locality on the Richmond River. *Cryptotis* is one of the commonest species, if one may judge from the numerous specimens usually present in collections. To the south I have found it sparingly just outside the limits of the County of Cumberland, on the eastern portion of the Blue Mts., at Grose Vale, and near Springwood, but not further west; thence it extends northwards to Queensland, as far at any rate as Pimpana, and Ipswich (Krefft), and westward to the Tableland at Bald Nob. The localities given in the B. M. Catalogue for specimens presented by Mr. Krefft, are Clarence River and Macquarie River. The latter is evidently a *lapsus calami* for Port Macquarie on the Hastings River, for not only is *Cryptotis* a coastal species but Mr. Krefft expressly says of its habitats, "Clarence, Richmond and Hastings Rivers and Queensland (neighbourhood of Ipswich)."

H. nasuta would appear to have been confounded with *H. freycineti* (perhaps also with *H. latopalmata*) by Mr. Krefft, who reported it as a Sydney frog. It is a Queensland species which, as far as present knowledge goes, reaches its southern limit about the Clarence.

* *C. australis* according to Mr. Krefft and Dr. Günther; *C. albopunctatus* (?) according to the B. M. Catalogue (2nd edition).

H. chloris, Blgr., either ranges to the north as far as Cairns, or it is very closely allied to *H. gracilentata*, Peters. In the Macleay Museum is a series of specimens of a frog which I have been accustomed to regard as *H. gracilentata*, collected at Cairns by Mr. W. W. Froggatt. On comparing these with my fine series of specimens of the Richmond and Clarence frog, I am disposed to regard them as referable to one and the same species.

Hylella bicolor is an elegant little frog of which until recently I have been unable to obtain examples; and then almost simultaneously they reached me from three different sources. It has a fairly wide but discontinuous distribution (northwards to Cape York); but where it does occur it is reported as common. My first examples were given to me by Mr. Musson, who obtained them near the western limits of the County of Cumberland. Then Mr. Olliff and Mr. Lea gave me specimens from the Lower Clarence; and it is also contained in an earlier collection of Mr. Lea's from Armidale and Tamworth, in which the specimens from the two localities were not kept separate; those of *Hylella* were probably obtained at Armidale, but the other six species in the collection [*Limnodynastes tasmaniensis*, *L. salminii*, *Hyperolia marmorata*, *Pseudophryne bibronii*, *Hyla cœrulea*, *H. lesueurii* and var. (?)] might very well have come from either locality.

The County of Cumberland may be credited with twenty-one species, of which I have seen all but *H. dimolops*. Of a total of thirty-seven species at present attributable to the colony, thirty-two occur in the Coast Districts. From the numbers given above, which represent those for the two districts best known at some distance apart, it is evident that the thirty-two species are not by any means all uniformly distributed.

(w) From Jervis Bay.

Limnodynastes peronii
dorsalis
Crinia signifera
haswelli, Fl.

Hyperolia marmorata
Pseudophryne bibronii
Hyla aurea
peronii

H. dentata

This is the most southerly coastal locality from which I have up till now been able to obtain specimens. Though in the time at my disposal the area collected over—a rather sandy tract in proximity to swamps—was not of great extent, half-grown specimens of *H. dentata* were surprisingly numerous, some of them jumping about in the grass.

On the occasion of my second brief visit (early in October) *L. dorsalis* at least was spawning vigorously. In more suitable country a few miles off near Tomerong, and in an umbrageous creek between Tomerong and Nowra, *H. phyllochroa* was croaking vigorously and preparing to spawn. In the B. M. Catalogue (2nd ed.) *H. phyllochroa* is recorded only from Sydney [and Errumanga], and *H. dentata* only from Sydney. The range of these two species, from present knowledge, may be said to be from Jervis Bay (probably even further to the south, but not extending to Victoria) northwards to the Clarence and Richmond (probably into Queensland), and westward to the western slopes of the Blue Mts.

My hopes of finding that extremely rare frog *Hyla jervisensis* were not realised. Though described by Duméril and Bibron so long ago as 1843, the species is, I believe, still known only from the type specimen obtained during the voyage of Péron and Lesueur.

(ii.) *The Northern Tableland.*

(x) From Bald Nob, a few miles N.E. of Glen Innes (Mr. A. M. Lea).

Limnodynastes peronii

Crinia signifera

tasmaniensis

Pseudophryne bibronii

Cryptotis brevis

Hyla ewingii var. *calliscelis*

In this locality *L. peronii* and *Cryptotis* are apparently stragglers from the coast.

(y) From Glen Innes; 3518 feet; 90 miles from the coast (Mr. A. M. Lea).



<i>Limnodynastes tasmaniensis</i>	<i>Pseudophryne bibronii</i>
<i>Crinia signifera</i>	<i>Hyla ewingii</i> var. <i>calliscelis</i>

(z) From Inverell; 1953 feet; 40 miles west of Glen Innes (Mr. A. M. Lea).

<i>Limnodynastes tasmaniensis</i>	<i>Pseudophryne bibronii</i>
<i>dorsalis</i>	<i>Hyla carulea</i>
<i>Crinia signifera</i>	<i>ewingii</i> var. <i>calliscelis</i>
<i>Hyperolia marmorata</i>	sp.*

(iii.) *The Southern Tableland.*

(aa) From Bathurst; 2200 feet (Mr. W. W. Froggatt).

<i>Limnodynastes dorsalis</i>	<i>Hyla ewingii</i> var. <i>calliscelis</i>
<i>Pseudophryne bibronii</i>	sp.†

(bb) From Bungendore; 2290 feet; 4 miles south of Lake George (Mr. W. W. Froggatt).

<i>Limnodynastes tasmaniensis</i>	<i>Crinia signifera</i>
<i>Hyperolia marmorata</i>	<i>Pseudophryne bibronii</i>
	<i>Hyla ewingii</i> var. <i>calliscelis</i>

(cc) From Pretty Point, Mt. Kosciusko Plateau (Mr. R. Helms).

<i>Crinia signifera</i>	<i>Hyla ewingii</i> var. <i>calliscelis</i>
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(iv.) *The Plains.*

(dd) From Tamworth; 1246 feet; 116 miles from the coast (Mr. A. M. Lea).

<i>Limnodynastes tasmaniensis</i>	<i>Pseudophryne bibronii</i>
<i>dorsalis</i>	<i>Hyla peronii</i>
<i>Hyperolia marmorata</i>	<i>ewingii</i> var. <i>calliscelis</i>
<i>Crinia signifera</i>	<i>lesueurii</i>

* A marbled or spotted frog (one specimen; six others in the mixed collection from Tamworth and Armidale) I have not previously met with. From the free fingers, the vomerine teeth, and the webbing of the toes, I should refer it to the marbled form of *H. lesueurii*.

† One specimen; possibly *H. lesueurii* var., but of a nearly uniform colour without any dark markings.

Two of these species, *H. peronii* and *H. lesueurii*, were represented in Mr. Musson's collection previously recorded from the same place; and *H. caerulea* then obtained is not in Mr. Lea's collection. *H. ewingii* var. *calliscelis* and *H. lesueurii* are probably stragglers from the Tableland, from which indeed Tamworth is apparently not sufficiently remote to exhibit in at all a marked manner the distinguishing characteristics of the subregion.

(ee) From Warialda; 1106 feet; 162 miles from the coast (Mr. J. H. Rose).

Limnodynastes ornatus

Heleioporus pictus

Two specimens of the former and one of the latter, which was turned up by the plough. Mr. Rose could have made a larger collection than this. His supply of spirit being very limited, however, he merely brought three frogs which he had not met with before (at Euroka).

From four localities close to or west of the Divide on the Northern Tableland (including Waroo in S. Queensland) fourteen species have been recorded; from seven localities west of the Divide on the Southern Tableland fifteen species; and from the Blue Mts. east of the Divide seventeen species: total for the Tablelands twenty-one species (including *Pseudophryne coriacea* at Waroo only), but without a single species peculiar to the subregion. Its fauna is made up of more or less cosmopolitan species slightly overlapped by some of the characteristic species of each of the adjacent subregions, for it certainly does separate two groups of genera and species which though they have a good deal in common yet present characteristic differences shown in the subjoined table:—

COAST.

PLAINS.

Mixophyes fasciolatus

*Limnodynastes fletcheri**

Limnodynastes peronii

Chiroleptes platycephalus

Cryptotis brevis

Heleioporus pictus

* Possibly only a well-marked variety of *L. tasmaniensis*.

COAST (contd.).

Phanerotis fletcheri
Crinia haswelli
Chiroleptes sp.
Philocryphus flavoguttatus
Pseudophryne australis
 coriacea
Hyla phyllochroa
 chloris
 jervisiensis
 dentata
 krefftii
 citropus
 freycineti
 nasuta
 dimolops
Hylella bicolor

PLAINS (contd.).

Notaden bennettii
Hyla rubella

COMMON TO BOTH SUBREGIONS.

Limnodynastes salminii
 tasmaniensis
 dorsalis
 ornatus
Crinia signifera
Hyperolia marmorata
Pseudophryne bibronii
Hyla caerulea
 peronii
 ewingii var. *calliscelis*
 aurea
 lesueurii
 latopalmata

In the Northern River Districts and further to the north *L. salminii* and *L. ornatus* are coastal species; elsewhere in New South Wales they are almost among the characteristic species from the Plains, though the latter also extends to the Tableland at Guntawang. *H. rubella*, the only West Australian form among the species from the Plains, is a coastal species in Queensland but not in N. S. Wales. Hence the geographical distribution of the batrachia of Queensland will probably present some differences in detail from that of the New South Wales species, a knowledge of which would materially help to explain certain matters which for the present must remain in doubt.

Analogous cases of a similar remarkable distribution are furnished by certain freshwater fishes, and earthworms. The Murray cod-perch (*Oligorus macquariensis*) and the freshwater cat-fish (*Copidoglanis tandanus*) occur both in the western waters, and in the Northern River Districts in the eastern waters also, the latter in the Richmond, the former in the Clarence as well as

in the Mary River in Queensland. Of a small group of earthworms characterised by the possession of a single male pore, of which *Cryptodrilus purpureus*, Mich., from Gayndah and Peak Downs, is the type, two species (including *C. purpureus* var.) are common in the Northern River Districts, but have not yet been recorded from further to the south, while a third is widely distributed in the interior of New South Wales as far south as the Murrumbidgee.

Chiroleptes platycephalus, recorded only from Bourke, Euroka, and Dandaloo, is at present peculiar to New South Wales, but not improbably it will be found to range further to the north and west; and as it seems to follow the Darling and its tributaries it should also occur further to the south. *Notaden* extends into Queensland, possibly also into Central Australia, but it has not yet been reported from Victoria. *Heleioporus pictus* is common to S. Australia, Victoria, and N. S. Wales, and not improbably ranges into Queensland.

Hyla ewingii var. *calliscelis* and *H. lesueurii* have become well established on the Tablelands and just reach the plains at Tamworth.

Whatever may have been the case in the past, when, as the geologists affirm, the Dividing Range was much higher, at the present time, except perhaps locally, the Tablelands and the Cordillera can hardly be a physical barrier of an insurmountable character to the migration of batrachia from one subregion to another. There is indeed evidence tending to show that characteristic coastal species do as stragglers manage to get a footing on the eastern side of the Tablelands where the conditions are favourable (e.g., *Mixophyes*, *Cryptotis*, *Hyla phyllochroa*, *H. citropus*, and *Pseudophryne australis* in the moist shady gullies of the Blue Mts.; *Hylella bicolor* at Armidale and *Cryptotis* at Bald Nob); just as a few from the Plains (*Limnodynastes fletcheri* and *Heleioporus pictus*) have reached the Tableland at Guntawang or at Waroo.

A much more potent factor in regulating migration seems to be climatic conditions, more particularly the amount of moisture

and all that that implies. In other words a number of hardy species seem alike able to flourish under such diverse conditions of life as prevail in the subtropical Northern River Districts, and in the dry country of the western plains. Others seem unable to maintain themselves away from the favourable conditions which attain a maximum in the coastal district and on the eastern side of the Tableland; while others again seem only perfectly at home in a region where the cycle of events may be summed up as devastating floods, disastrous droughts, and intervening good seasons, in varying intensity.

In an interesting paper entitled "Notes upon the History of Floods in the River Darling" (Journ. and Proc. Roy. Soc. of N. S. Wales, 1886, xx. p. 155), Mr. H. C. Russell, B.A., F.R.S., has brought together the records from all available sources, a perusal of which indicates in a very suggestive manner the extremes to which animal life in the interior is exposed. When in a severe drought, as reported by Mr. Russell's correspondents, the country becomes a desert, the swamps, lagoons, and the tributaries of the Darling are dry, and the river itself is reduced to the condition of a chain of waterholes sometimes miles apart and in places salt, it would appear as if at any distance back from what is left of the river frogs must over a considerable area run great risk of absolute extermination unless their æstivating capabilities have become correspondingly developed. The survivors get their opportunity again with a big flood, which may inundate the back country to a distance of twenty, forty, or even seventy miles, once more filling the swamps and lagoons. A succession of good seasons encourages a flux of animal life for a time, with the inevitable ebb when a drought gives the check, the cycle, as Mr. Russell thinks, occupying a period of about nineteen years.

Several of the characteristic species of the Plains are not yet recorded from the southern colonies, and in N. S. Wales they have not all migrated from the coast. If not developed in the subregion there must have been migration at some time from the north. But this and other cognate questions cannot be satisfactorily considered until more is known of the fauna of Queens-

land ; though not less to be desired is an up-to-date knowledge of the faunas of West and South Australia and Tasmania.

Mr. A. H. S. Lucas has recently revised the batrachian fauna of Victoria (Proc. Roy. Soc. Vict. 1891, iv. (2), p. 59), bringing up the number of species to sixteen, or less than half the number recorded from N. S. Wales. In this paper Mr. Lucas refers to the distinctness of species on the two sides of the Great Dividing Range in Victoria. At present, however, it is not possible to institute any very satisfactory comparison between the faunas of the two colonies because the groups separated by the Divide in one colony do not present any marked features in common with the corresponding groups in the other. Of the sixteen Victorian species five are peculiar, nine are widely distributed Australian or Eastern Australian forms (seven of them in N. S. Wales being common both to the Plains and the Coast), and two occur outside of Victoria but not or only doubtfully in N. S. Wales ; whereas our characteristic species, whether of the Plains (except *Heleioporus pictus*, which Mr. Lucas records from Parwan, south of the Divide) or of the Coast, are not yet known to extend to Victoria. Additional material which would supply data for the exact determination of the southern limit of certain species in this colony and the northern limit of some of the Victorian species is much to be desired ; as also are collections from the interior of the continent, especially from anywhere outside the drainage area of the great river system of this and the adjoining colonies, and where such creeks or rivers as there are do not directly reach the sea.